

[illegible]

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For: Calibration Artifact and Method of Using the Same

1 1. A calibration artifact for calibrating a machine vision measurement system,
2 the calibration artifact comprising:
3 a substrate; and
4 a plurality of concentric rings on one surface of the substrate, each
5 ring of a different pre-defined size.

1 2. The calibration artifact of claim 1 wherein the change in the size of any two
2 adjacent rings is different than the change in size of any other two adjacent rings.

1 3. The calibration artifact of claim 1 in which each ring has an inner edge and
2 an outer edge.

1 4. A method of calibrating a machine vision measurement system, the method
2 comprising:
3 placing a calibration artifact including a series of concentric rings
4 under a camera of the machine vision measurement system;
5 choosing a magnification level;
6 measuring the size of a first largest ring in pixels;
7 measuring the size of a second largest ring in pixels;
8 comparing the sizes; and
9 determining, from the comparison, the actual diameter of said ring.

1 5. The method of claim 4 in which each ring is of a pre-determined different
2 size and wherein the change in the size of any two adjacent rings is different than the
3 change in size between any other two adjacent rings.

1 6. The method of claim 4 further including determining a first average of the
2 measured size of the first largest ring in pixels and the measured size of the second largest
3 ring in pixels.

1 7. The method of claim 6 further including measuring the size of a third largest
2 ring in pixels and determining a second average of the measured size of the third largest
3 ring in pixels and the measured size of the second largest ring in pixels.

1 8. The method of claim 7 in which comparing includes using the first and

2 second averages.

Year	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100																																				
Population	1,000,000	1,050,000	1,100,000	1,150,000	1,200,000	1,250,000	1,300,000	1,350,000	1,400,000	1,450,000	1,500,000	1,550,000	1,600,000	1,650,000	1,700,000	1,750,000	1,800,000	1,850,000	1,900,000	1,950,000	2,000,000	2,050,000	2,100,000	2,150,000	2,200,000	2,250,000	2,300,000	2,350,000	2,400,000	2,450,000	2,500,000	2,550,000	2,600,000	2,650,000	2,700,000	2,750,000	2,800,000	2,850,000	2,900,000	2,950,000	3,000,000	3,050,000	3,100,000	3,150,000	3,200,000	3,250,000	3,300,000	3,350,000	3,400,000	3,450,000	3,500,000	3,550,000	3,600,000	3,650,000	3,700,000	3,750,000	3,800,000	3,850,000	3,900,000	3,950,000	4,000,000	4,050,000	4,100,000	4,150,000	4,200,000	4,250,000	4,300,000	4,350,000	4,400,000	4,450,000	4,500,000	4,550,000	4,600,000	4,650,000	4,700,000	4,750,000	4,800,000	4,850,000	4,900,000	4,950,000	5,000,000	5,050,000	5,100,000	5,150,000	5,200,000	5,250,000	5,300,000	5,350,000	5,400,000	5,450,000	5,500,000	5,550,000	5,600,000	5,650,000	5,700,000	5,750,000	5,800,000	5,850,000	5,900,000	5,950,000	6,000,000	6,050,000	6,100,000	6,150,000	6,200,000	6,250,000	6,300,000	6,350,000	6,400,000	6,450,000	6,500,000	6,550,000	6,600,000	6,650,000	6,700,000	6,750,000	6,800,000	6,850,000	6,900,000	6,950,000	7,000,000	7,050,000	7,100,000	7,150,000	7,200,000	7,250,000	7,300,000	7,350,000	7,400,000	7,450,000	7,500,000	7,550,000	7,600,000	7,650,000	7,700,000	7,750,000	7,800,000	7,850,000	7,900,000	7,950,000	8,000,000	8,050,000	8,100,000	8,150,000	8,200,000	8,250,000	8,300,000	8,350,000	8,400,000	8,450,000	8,500,000	8,550,000	8,600,000	8,650,000	8,700,000	8,750,000	8,800,000	8,850,000	8,900,000	8,950,000	9,000,000	9,050,000	9,100,000	9,150,000	9,200,000	9,250,000	9,300,000	9,350,000	9,400,000	9,450,000	9,500,000	9,550,000	9,600,000	9,650,000	9,700,000	9,750,000	9,80

1 10. A calibration system comprising:
2 a calibration artifact including:
3 a substrate; and
4 a plurality of concentric rings on one surface of the substrate, each
5 ring of a different pre-defined size and wherein the change between the size of any two
6 adjacent rings is different than the change between the size of any other two adjacent rings;
7 and
8 a software algorithm including a database containing the size of each
9 ring and data reflecting the change in size between each pair of adjacent rings

- 1 11. A method of calibrating a machine vision measurement device, the method
- 2 comprising:
- 3 placing a calibration artifact including at least one ring with inner and
- 4 outer edges under a camera of the machine measurement system;
- 5 choosing a magnification level;
- 6 measuring the size of the outer edge of the ring in pixels;
- 7 measuring the size of the inner edge of the ring in pixels; and
- 8 averaging the measured size of the outer edge of the ring and the inner
- 9 edge of the ring.